NOMENCLATURE OF THE LUPINUS ARGENTEUS AND L. CAUDATUS COMPLEXES

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The genus *Lupinus* has long been recognized as one of the very complex groups of plants and the many names published add to the confusion. Among the groups of lupines, the *L. argenteus* complex, which occupies the Great Basin and the Rocky Mountain regions, has been one of the most difficult. Hybridizing studies on this complex were conducted at the Rocky Mountain Biological Laboratory over a five year period. These studies demonstrated that hybridization between the *L. argenteus* and the *L. caudatus* complexes can explain many of the variations which were named and that the two form polymorphic interacting taxa covering much of the same geographic area. The long lists of synonymy add little to the basic understanding of the problem and will be included in the monographic paper in the University Museum Contribution Series. Only the basic names of the group are presented here along with the reasons for the suggested changes in rank. The remaining names of related taxa, in which no change is suggested, are omitted. Since the key to all of the taxa of the group will be in the monograph it is not included in the present paper.

The two complexes presented here are very closely related through introgressive hybridization with *L. caudatus* at the xerophytic extreme and some of the subspecies of *L. argenteus* at the mesophytic extreme. The flower shape of both is very similar with the banner generally reflexed well above the midpoint. There is a patch of pubescence in the central area of the banner on the dorsal side which may be covered by the upper lip of the calyx. In a few taxa this patch of pubescence is absent. There is a well developed spur at the base of the upper lip of the calyx in *L. caudatus*

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and the trait extends into the *L. argenteus* complex. The flowers of the taxa treated here are usually from 8-12 mm long and this separates them from the smaller related *L. parviflorus* complex which will be treated separately. There are 80 synonyms involved in the complete nomenclature so only the basonyms will be cited below.

1. *Lupinus argenteus* Pursh (subsp. *argenteus* var. *argenteus*) Fl. Am. Sept. 2: 468, 1814. Type: Banks of the Kooskoosky, — now considered to be the Clearwater River, *M. Lewis* 4. (Holotype: K, former Lambert Herb.). The closest matching material presently is in Montana, on the eastern base of the Rocky Mountains. The habitat is arid plains and sagebrush from Canada to Arizona.

1a. *Lupinus argenteus* subsp. *argenteus* var. *tenellus* (Dougl. ex. G. Don) Dunn, Leafl. W. Bot. 7: 254, 1955. Type: Vicinity of Grand Rapids of Columbia River, *Douglas* 277. (Holotype: CGE). An outcropping genome, completely sympatric with *argenteus*, the flowers narrow viewed laterally and the leaflets often very narrow. The taxon represents introgression from more xerophytic taxa from another complex. It is more abundant than *argenteus* in the more arid areas but it has not demonstrated dominance of an ecological area.

1b. *Lupinus argenteus* subsp. *rubricaulis* (Greene) Hess & Dunn, comb. nov. Basonym: *L. rubricaulis* Greene, Pl. Baker. 3: 35, 1901. Type: Crested Butte, Colorado, *Baker* 342. (Holotype: ND; Isotypes MIN, MO, RM). The taxon is an altitudinal subspecies associated with montane forests, commonly in the open park areas in the spruce-fir zone but intergrading in numerous places through the Rocky Mountains with *argenteus* or *tenellus* at its lower limits and with *spathulatus* at its upper limits.

1c. *Lupinus argenteus* subsp. *spathulatus* (Rydb.) Hess & Dunn, comb. nov. Basonym: *L. spathulatus* Rydb., Bull. Torr. Bot. Club 29: 204, 1902. Type: Wasatch Mountains in 1869, *S. Watson* 225. (Holotype: NY). The taxon is an-

other altitudinal subspecies at the subalpine zone, commonly growing under and among spruce-fir forests up to timberline. It grades into *rubricaulis* completely and either of the subspecies may simulate the appearance of the other by ecological modification. The broad flat leaflets may be found at lower elevations in shaded areas in aspen groves, while the narrow leaflets may be produced at high elevations in exposed locations. However, there is as much as a month's difference in the flowering times at the different elevations, requiring genetic alterations to accommodate the ecological differences. The material from the type locality appears quite distinct but can be matched by numerous specimens from other areas so that the same process appears to be functional throughout the range of subspecies *spathulatus*.

2. *Lupinus* × *alpestris* A. Nels. Hybridity suggested (*L. caudatus* × *L. argenteus*). Bull. Torr. Bot. Club **26:** 127, 1899. Type: Medicine Bow Mts., Wyoming, prob. Univ. summer camp, *E. Nelson* 5070. (Holotype: RM; Isotype: MO). The original material is closest to subsp. *rubricaulis* but the upper surface of the leaflets is finely pubescent, indicating introgression from *L. caudatus*. The multiple locations where hybridization has taken place have produced a whole range of intermediate forms throughout the geographic region in which *caudatus* and the *argenteus* complex occur. Some of these have become relatively stable intermediates at various levels between the two taxa with numerous names applied by various investigators. In most areas the *argenteus* traits dominate and the taxon is generally sympatric with *argenteus*. However in the Great Basin, where there is greater aridity, the vegetative characteristics of *caudatus* prevail, while the floral characteristics of *argenteus* tend to be dominant. It seems preferable to retain the hybrid binomial designation to indicate what is involved, even if the entity is highly variable, rather than reduce it to one of the meaningless varietal names which have been published.

3. *Lupinus caudatus* Hell. (subsp. *caudatus*) Proc. Calif. Acad. **2:** 197, f. 61, 1862. Type: Carson Valley, *Kellogg*.

(Holotype: CAS 62286). Associated with sage brush, extending into the arid pine zones along the east side of the Sierra Nevada Mts. The plants have a densely sericeous hair covering throughout and the upper lip of the calyx has a well developed spur at the base. The spur almost disappears in a clinal gradient eastward to the Laramie area. The genetic markers of ciliation near the claws of the wings and keel, on the margins and laterally, are generally present but become less frequent eastward.

3a. *Lupinus caudatus* subsp. *montigenus* (Heller) Hess & Dunn, comb. nov. Basonym: *L. montigenus* Heller, Muhlenbergia **6:** 109, f. 16, 1910. Type: Mt. Rose, Nevada, *Heller* 9880. (Holotype: RENO; Isotypes: MO, RM, UC). This taxon is viewed as an altitudinal subspecies, restricted to the higher mountains of the east side of the Sierra Nevada Mts. The flowers are the largest of the *caudatus* complex and at the higher peaks have very little development of the calyx spur, with the banner reflexing at the midpoint but the gradation into caudatus at the lower zones appears complete, with the spur becoming very pronounced.

3b. *Lupinus caudatus* subsp. *cutleri* (Eastw.) Hess & Dunn, comb. nov. Basonym: *L. cutleri* Eastw., Leafl. W. Bot. 4: 192, 1945. Type: 18 mi NW Fort Defiance, Arizona, *Cutler* 2141. (Holotype: CAS. Isotypes: DS, MO). This taxon appears restricted to the mountains of the basin area of southeastern Utah, northern Arizona, and northwestern New Mexico. It has predominantly *caudatus* characteristics and appears to intergrade with subspecies *argophyllus* but also appears to have characteristics derived from introgression from an undetermined source.

3c. *Lupinus caudatus* subsp. *argophyllus* (Gray) Phillips, Res. Stud. Wash. St. Coll. **23:** 200, 1955. Basonym: *L. decumbens* Nutt. var. *argophyllus* Gray, Mem. Am. Acad. 4: 37, 1849. Type: Santa Fe, New Mexico, *Fendler*. (Holotype: GH). This taxon is the product of early introgression between *caudatus* and *argenteus*. Floristically the traits

are predominantly those of *caudatus*, with all the characteristic *caudatus* markers, including the ciliation near the claws of the wings and keel, and a well developed spur on the calyx. Vegetatively the characteristics are predominantly those of *argenteus*, including the short petioles, and the leaflets are frequently nearly glabrous above. Subspecies *argophyllus* is quite distinct from any of the material treated as × *alpestris*, and appears to be a stabilized taxon. It does appear to intergrade into *caudatus* in southwestern Colorado.

4. *Lupinus* × *inyoensis* Heller (pro species). Hybridity suggested (*L. caudatus* × *L. palmeri*). Muhlenbergia 2: 211, 1906. Type: Foothills W of Bishop, California, *Heller* 8312. (Isotypes: CAS, ISC, MO, UC). The only suggested change is the insertion of the × to indicate hybrid origin. Three of the four isotypes had spreading hairs, the main trait derived from *palmeri*, while the fourth had the typical appressed hairs of *caudatus* suggesting that the original collection represented a mixed population. In several field population samples made in 1968 in Nevada there were mixed plants of *L. palmeri* and *L. caudatus* with occasional hybrid plants. The population of × *inyoensis* appears restricted to Inyo and Mono Cos., California.

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